HOW TO MAKE

MICRO FLIERS

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MICRO FLIERS

CREATED & WRITTEN BY THE TOP THAT! TEAM
DESIGNED BY TOP THAT! AND THE VISUAL WORKS
PHOTOGRAPHY BY TOP THAT! AND NASA

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&NOBLE
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NEW YORK

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Contents

3 **Ready for Take-off**
4 Getting Started
5 Safety Precautions
6 Assembling Your Airplane Models
8 Assembling Your Rocket Models
9 Using The Launcher
10 Altitude Tracker

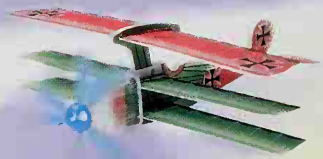
13 **Flight Facts**
14 Aviation History
15 Aerodynamics
16 Rocket History

18 **Micro Flier Models**
19 MIG 25 'Foxbat'
20 Blackbird
21 Sunderland Seaplane
22 B-52
23 Spitfire
24 P-51 Mustang
25 Hawker Hurricane
26 Messerschmitt Bf 109
27 Fokker Dr.I Triplane
28 F-16
29 V2 rocket
30 Vostok
31 Mercury-Redstone
32 Mercury-Atlas
33 Saturn V
34 Ariane 5
35 Columbia
36 H-11 Rocket

37 **Micro Flier Projects**
38 Rocket Balloon
40 Rocket Fuel Experiment
42 Water Whoosher
46 Tricky Trajectories
48 Step Rocket
50 DIY Rocketry
52 Space Shuttle
54 Parachutes
56 Glider
58 Stunt Bomber
60 Concorde
62 F15 Fighter

Ready for Take-off

Getting Started



This kit contains everything you need to make eighteen amazing Micro Fliers.

As well as the cool colored models provided in the kit, you will require some additional materials to complete some of the projects. But, don't worry, you can buy or find parts which are suitable without spending much money at all. You should be able to find paper, poster board, scissors, tape, vinegar, sugar cubes, baking soda and a bicycle pump around the house.

After you have tried and tested all of the ideas in this Micro Fliers book, try experimenting with your own designs.

WARNING

Safety Precautions

Micro Flier experiments can be dangerous! Follow these simple safety rules to avoid accidents!

Always launch your Micro Fliers in a wide, open space.

Never point the fliers at anyone or anything.

Do not lean over your flier while you are trying to launch it.

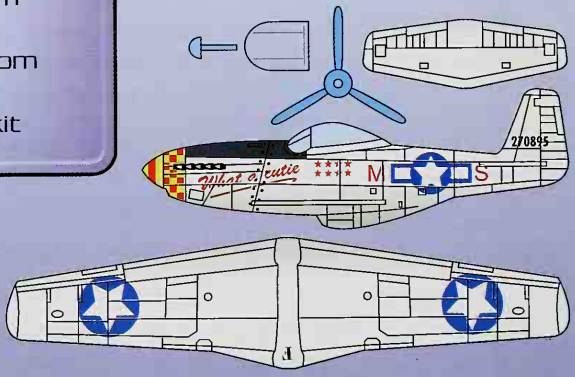
Ask for adult help with the Water Whoosher project.

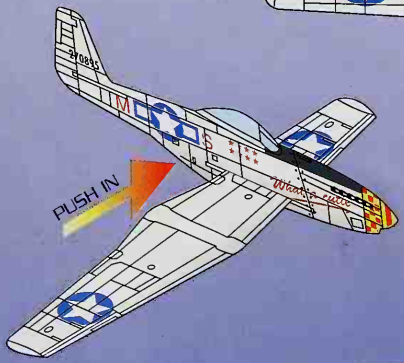
Assembling Your Airplane Models

You will need

- Micro Rocket die-cut from your kit
- Sticky putty from the kit
- Rubber bands from the kit
- Launcher from kit

1 Check the relevant diagram to make sure that you have all of the pieces for your chosen plane.

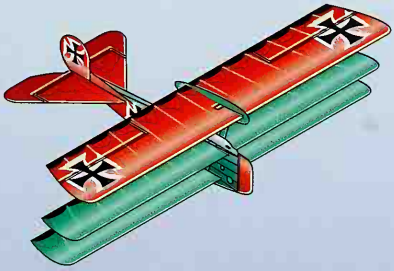


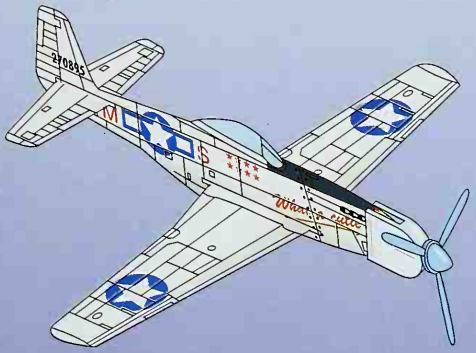


2 Hold the body of the plane and gently push the appropriate wing(s) through the central slot.

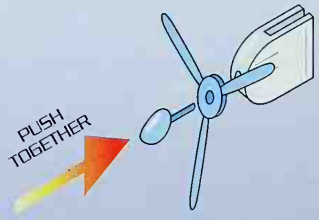
Be careful not to bend the wings since this could affect the flight.

3 If your chosen plane has more than one wing, repeat this process. Make sure that the top wing markings face upwards.



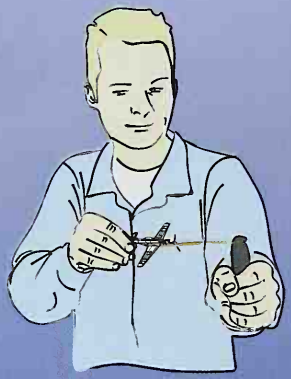


4 Slide your chosen plane's tail into the back slot.



5 If a propeller is required, assemble the pieces found in the Micro Fliers kit and attach it to the front of your plane.

6 Models can be launched by hand or with the catapult contained in the kit. Improve flight by bending the wings into a shallow "y" shape and adding sticky putty to the nose

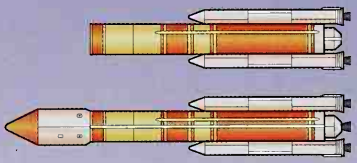


Assembling Your Rocket Models

You will need

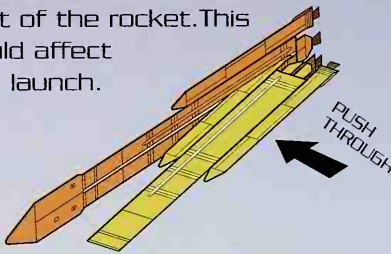
- Micro Rocket die-cut from your kit
- Sticky putty from the kit
- Rubber bands from the kit
- Launcher from kit

Create and launch these cool Micro Rockets and you'll soon feel like a real astronaut!



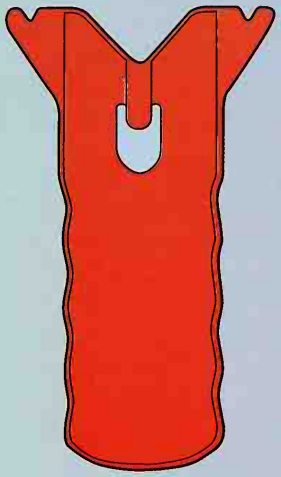
1 Check the diagram to make sure that you have all of the pieces for your rocket.

2 Gently push the solid rocket through the central slot of the matching piece. Push it in at an angle and be careful not to bend either part of the rocket. This could affect the launch.



3 Add sticky putty to the nose end of your rocket. Do not cover the groove at the nose, because this will be used for launching.

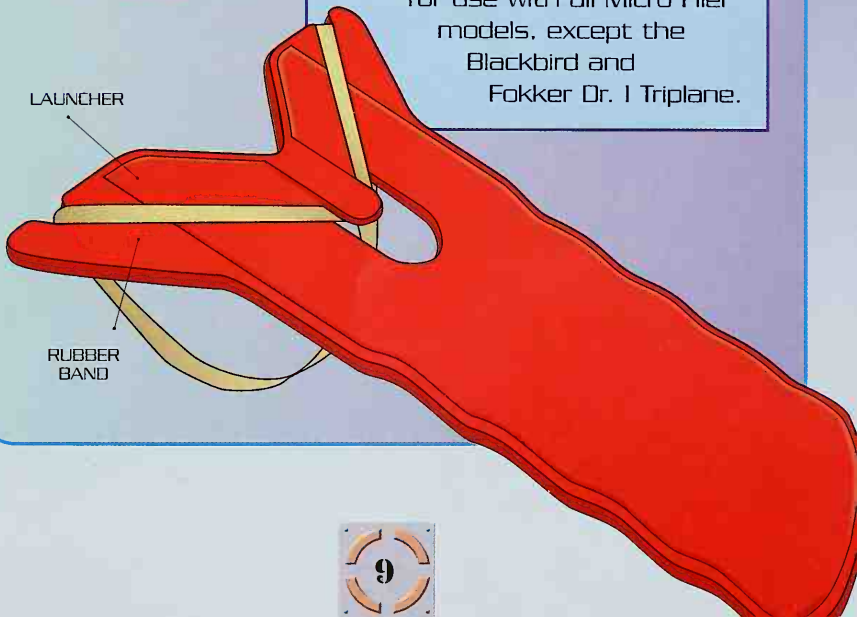
4 Micro Rockets should be launched with the special launcher contained in the Micro Fliers kit.



Using The Launcher

Before you use the launcher you need to prepare it. Feed the rubber band into the grooves at the end of the launcher and then hook it around the plastic pin in the center, as shown. Connect the rubber band to the groove at the end of your rocket or airplane. It is now ready for you to use to launch your Micro Fliers into the sky!

The launcher has been designed for use with all Micro Flier models, except the Blackbird and Fokker Dr. I Triplane.



Altitude Tracker

You will need

- Poster board
- Pencil
- Scissors
- Protractor
- 2 friends
- Tape
- Ruler
- Needle
- Thread
- Bead

Test how high your Micro Fliers can fly with this nifty invention!

1 Cut a rectangle measuring 6 in. by 10 in. (15 cm by 25 cm) from a piece of poster board.

2 Roll one of the short sides over so that a hollow tube is formed. Tape it in place. Now make a 'P' shape by cutting a 3½ in. by 3½ in. (9 cm by 9 cm) box from the opposite short side. (Turn to page 12 for a blueprint diagram).

3 Carefully use the needle to make a hole in the top right-hand corner of the 'P' shape.

4 Use a ruler to draw vertical and horizontal lines which meet at the hole.

5 Place the protractor on the Altitude Tracker so that 0 degrees is on the vertical line and 90 degrees is on the horizontal line. Carefully draw on the measurements, as shown on page 12.

6 Slip a piece of thread through the hole created in step 3 and tie it in place.

7 Tie a bead at the end of the thread so that it can swing freely.

Three, two, one... BLAST OFF!

8 Check individual Micro Rocket plans for this symbol. It tells you how far you must stand away from the launch site.

9 Ask a friend to launch the Micro Rocket and follow its progress through the hollow viewing tube on your Altitude Tracker.

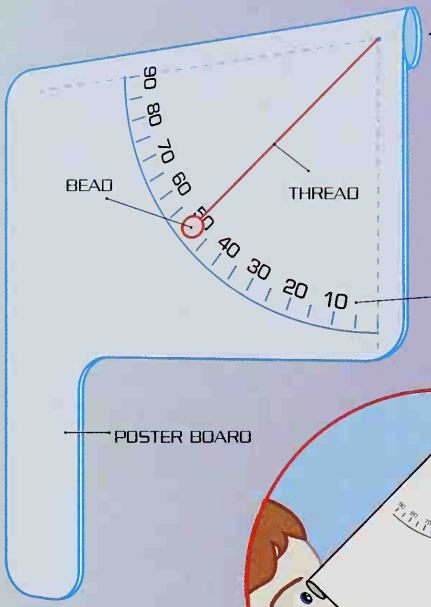
10 Hold the tracker still when the rocket reaches its highest point. Ask a second friend to read the trajectory measurement shown by the bead.

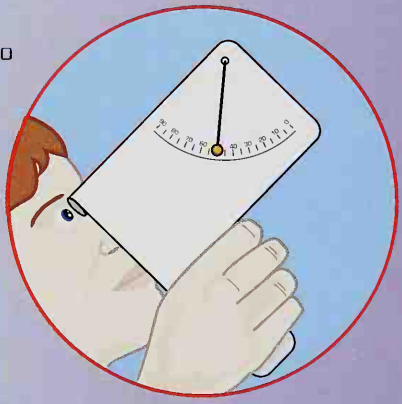
Use the following chart to work out the altitude your Micro Fliers reach.

(The fliers must be travelling upwards for the chart to work).

Trajectory in degrees	Distance from launch site (approx)					
	5 m/16 ft		10 m/32 ft		15 m/48 ft	
90	286 m	938 ft	572 m	1877 ft	859 m	2818 ft
80	28.4 m	93 ft	56.7 m	186 ft	85 m	279 ft
70	13.7 m	45 ft	27.5 m	90 ft	41.2 m	135 ft
60	8.7 m	29 ft	17.3 m	57 ft	268 m	85 ft
50	6 m	20 ft	11.9 m	39 ft	17.9 m	59 ft
40	4.2 m	14 ft	8.4 m	28 ft	12.6 m	41 ft
30	2.9 m	10 ft	5.8 m	19 ft	8.7 m	29 ft
20	1.8 m	6 ft	3.6 m	12 ft	5.5 m	18 ft
10	0.9 m	3 ft	1.8 m	6 ft	2.6 m	9 ft
0		0		0		0
	Altitude in meters and feet					

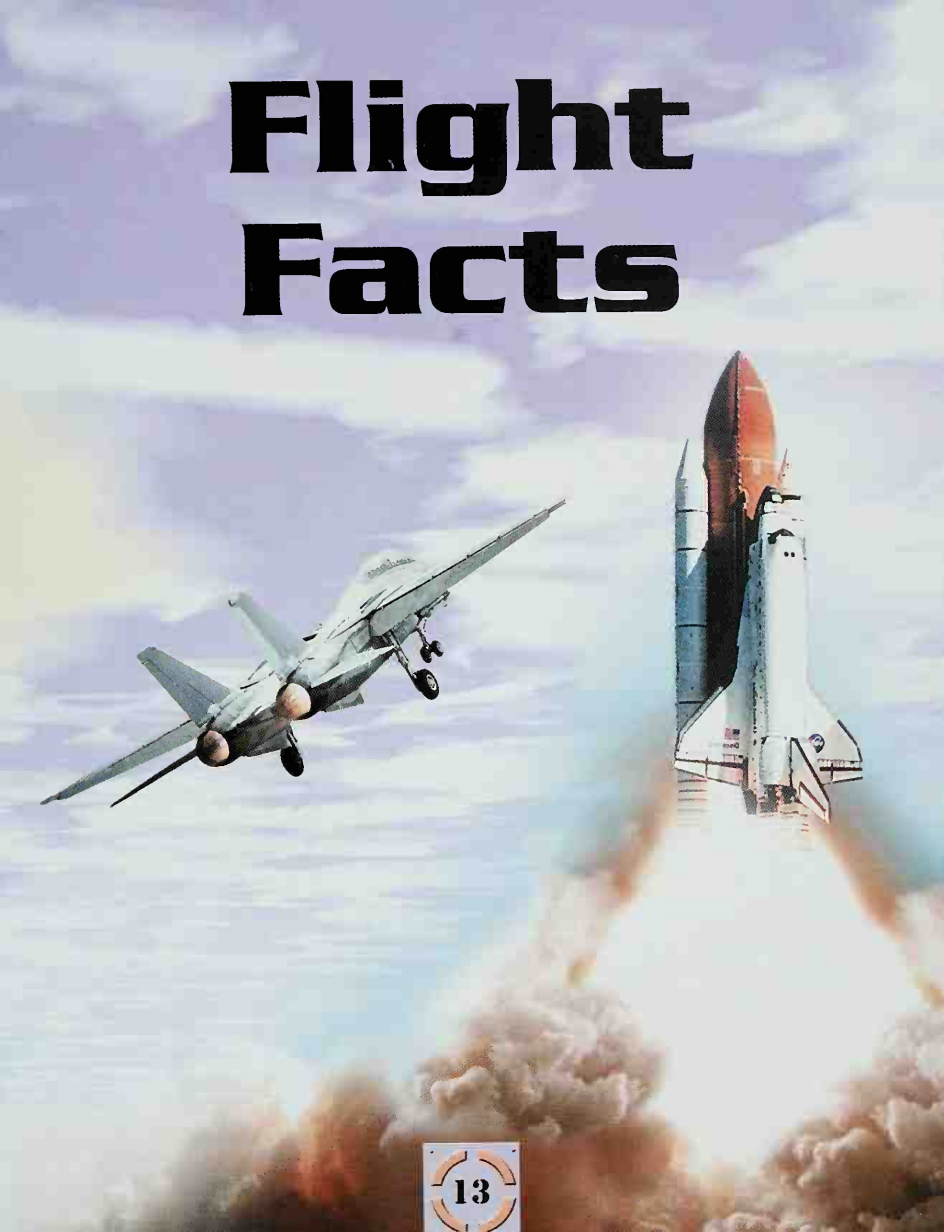
ALTITUDE TRACKER





Example:	
Distance from launch site (ft)	33
Trajectory in degrees	50
Altitude (ft)	39

Flight Facts

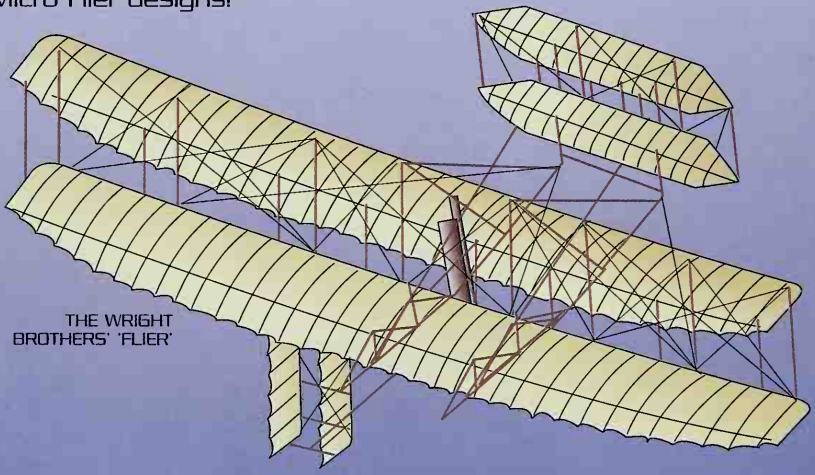


Aviation History

In December 1903, two American brothers, Orville and Wilbur Wright, became the first people to achieve powered, piloted flight. Inspired by Otto Lilenthal's early gliders, their airplane *Flyer*, remained airborne for 12 seconds on its first flight and travelled 120 feet.

It is very likely that the first Micro Fliers were inspired by the Wright brothers' amazing achievement and by 1930 paper Micro Flier models were regularly used for exploring aerodynamics and airplane design.

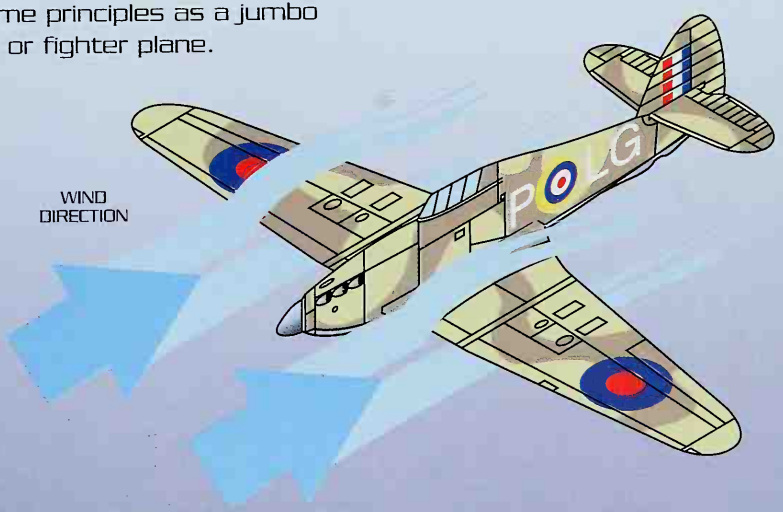
Ask your parents or grandparents if they used to fly paper airplanes or rockets. If the answer is "yes," then they'll probably have some handy hints when you start working on your own Micro Flier designs!



THE WRIGHT BROTHERS' 'FLIER'

Aerodynamics

Although it may seem hard to believe, the Micro Flier airplanes work on exactly the same principles as a jumbo jet or fighter plane.



Just like an airplane, the wings on a Micro Flier are a special aerodynamic shape. In most cases, the wing is curved on top, so that air travels faster over the wing than under it. As a result, the air pressure above the wing is reduced. This creates a small vacuum and the airplane gets sucked up into the air!

Question:

What's the difference between a Micro Flier and a jumbo jet?

Answer: Not a lot!

Rocket History

The history of rockets can be traced back to 13th century China. Under threat from Mongolian invaders, the Chinese developed a variety of rocket projectiles including exploding grenades, fire arrows and cannons – yikes!

In 1903 a Russian scientist called Konstantin Tsiolkovsky suggested that rockets could be used for space travel. In the 21st century, rockets are used all over the world in wars, to launch satellites, for space travel and for firework displays.

The Final Frontier

Rockets have come a long way since the 13th century and are now being used to explore space: the final frontier.The average distance from Earth to the Moon is 238,868 miles (384,403 kilometers). With modern rocket technology this enormous journey is possible in just three days! At a cost of $25 billion Apollo 11, the first mission to land

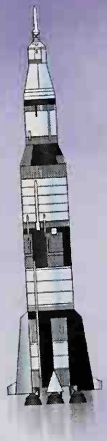
astronauts on the Moon, blasted off on July 16, 1969. On board were Neil Armstrong, Edwin Aldrin, and Michael Collins.

Lunar Landing

For three days, Apollo 11 voyaged towards the Moon without rocket power, slowing down because of the pull of Earth's gravity.

At 215,004 miles (346,000 kilometers) from the Earth, it was travelling at only 1988 mph (3200 kph). As the Moon's gravity started to take effect, the spacecraft gained speed. To slow down and enter into orbit around the Moon, an onboard rocket was fired. Then Eagle, the lunar landing craft, descended under rocket control onto the Moon's surface on July 20, 1969. Neil Armstrong was the first person to set foot on the Moon.

Micro Flier Models



MIG 25 'Foxbat'

48 FT
15 M
Track Zone

Micro Flier Facts

- Built in the 1960s, the MIG 25 'Foxbat' was designed to intercept and destroy other aircraft.
- It has a top speed of 1,863 mph and can fly 67,883 feet above the ground.
- The MIG 25 can fly in all weather conditions, by day and by night.

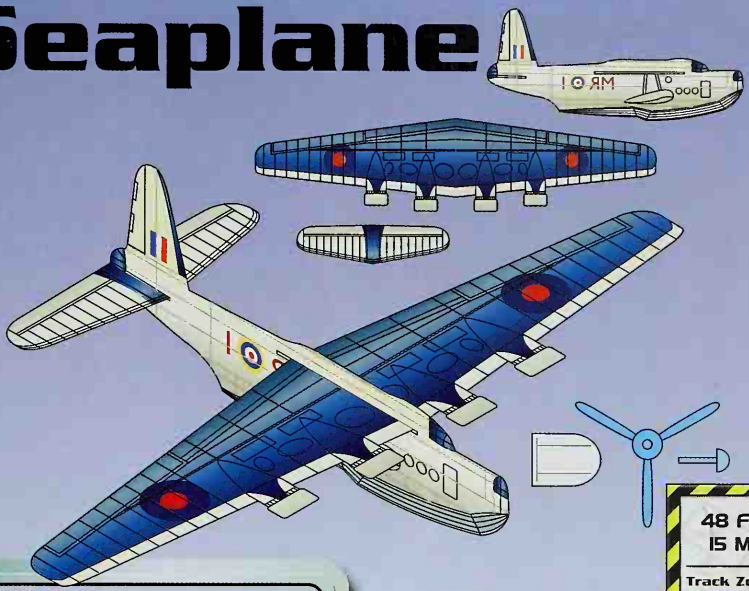
Blackbird

48 FT
15 M
Track Zone

Micro Flier Facts

- The Blackbird plane was designed to gather intelligence at high altitude – it can fly three times faster than the speed of sound!
- Blackbird was used by the military from 1967 to 1990.
- Today, only three Blackbird planes remain operational: they are used by NASA for scientific research.

Sunderland Seaplane



48 FT
15 M
Track Zone

Micro Flier Facts

- The Sunderland was the chief flying boat on the Allied side in World War II.
- From sea rescues and evacuation to U-boat sinking, the Sunderland was very versatile.
- The Germans nicknamed it 'The Flying Porcupine'.

B-52

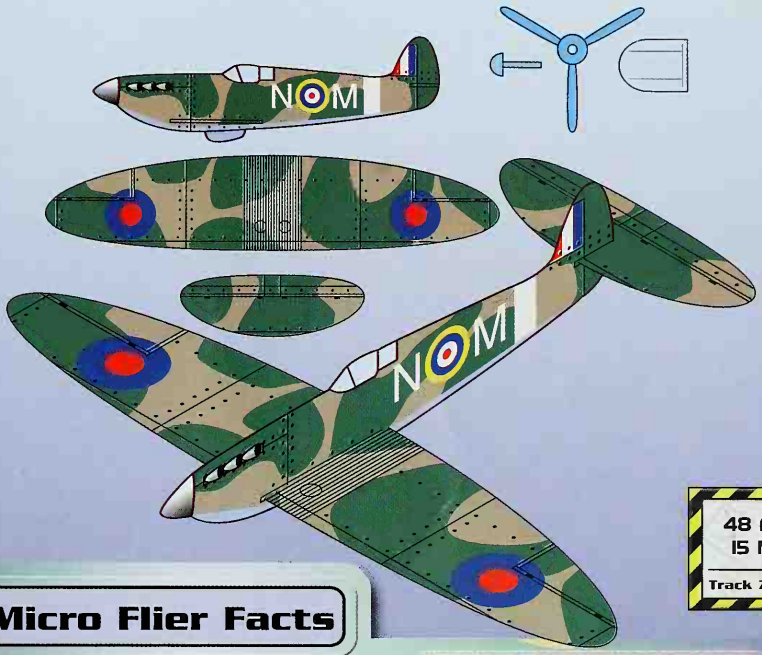
Long Range Bomber

48 FT
15 M
Track Zone

Micro Flier Facts

- The B-52 was designed to drop nuclear bombs from the stratosphere – it can fly 6,868 miles before it needs to refuel.
- The B-52 is still in service, 40 years beyond its planned retirement date.

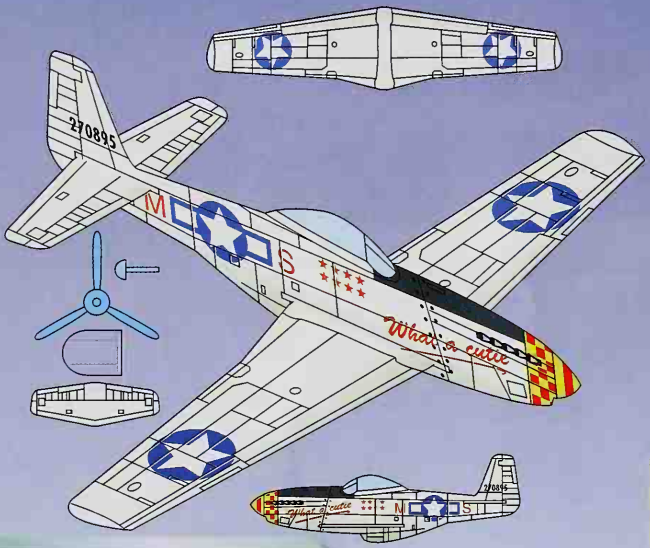
Spitfire



Micro Flier Facts

- The Spitfire was the most important airplane on the Allied side in World War II.
- The Spitfire was armed with eight machine guns!
- The Spitfire's main aerial opponent was the German Messerschmitt Bf 109.

P-51 Mustang

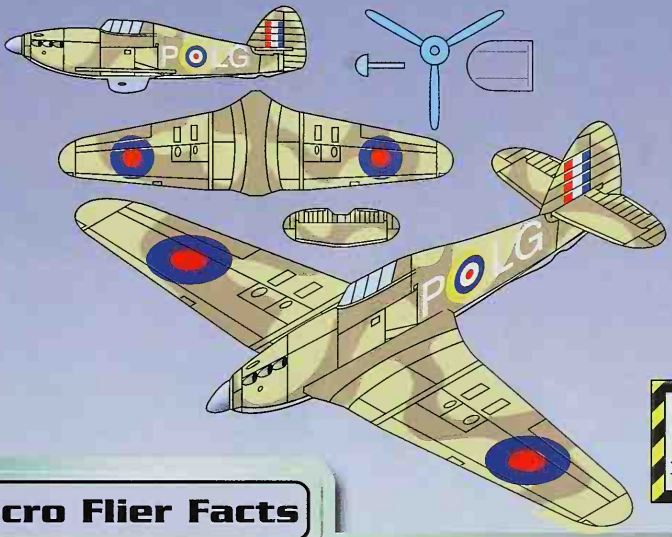


48 FT
15 M
Track Zone

Micro Flier Facts

- The North American P-51 Mustang was designed, built and tested in just 17 weeks!
- Equipped with large fuel tanks and heavily armed, the Mustang was used to escort bombers on missions behind German lines in World War II.
- The number of Allied bomber losses was greatly reduced with the introduction of Mustangs.

Hawker Hurricane



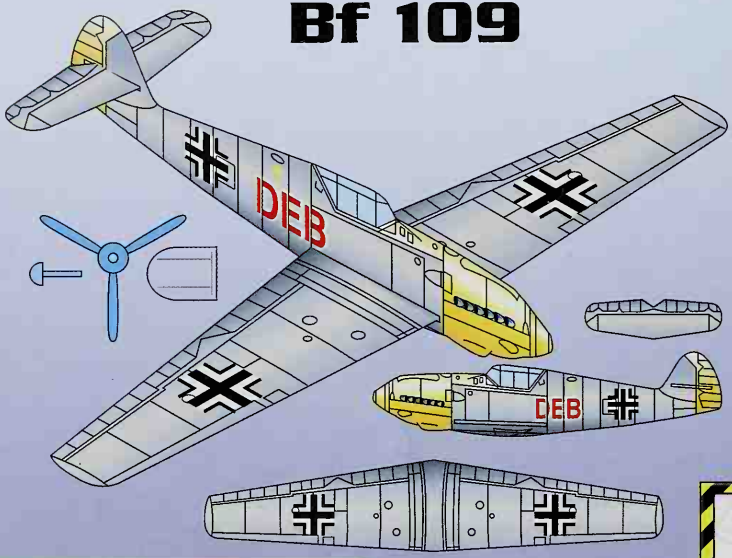
48 FT
15 M
Track Zone

Micro Flier Facts

- The Hawker Hurricane was the most important airplane on the Allied side during the Battle of Britain.
- The Hawker Hurricane was the RAF's first eight-gunned monoplane.
- Far slower than German fighters, whenever possible, the Hawker Hurricane's main aerial opponent was the Heinkel He 111 bomber.

Messerschmitt

Bf 109

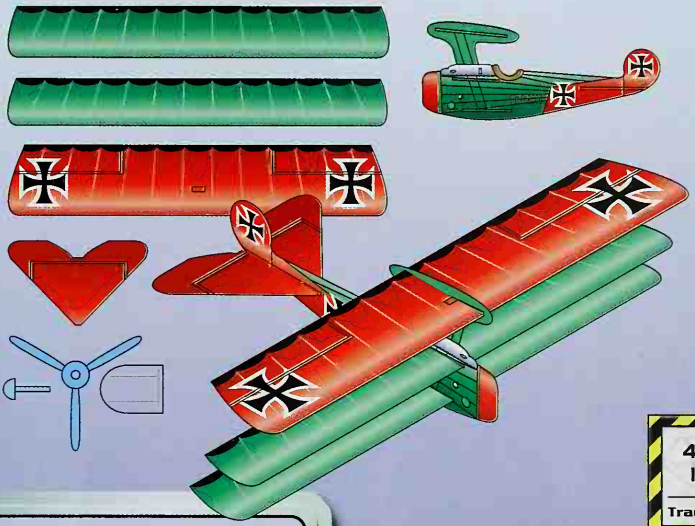


48 FT
15 M
Track Zone

Micro Flier Facts

- The Messerschmitt Bf 109 was the most important airplane on the German side in World War II.
- The Messerschmitt Bf 109 was armed with one cannon and four machine guns!
- The Messerschmitt Bf 109's main aerial opponent was the Allied forces' Spitfire.

Fokker
Dr.I Triplane

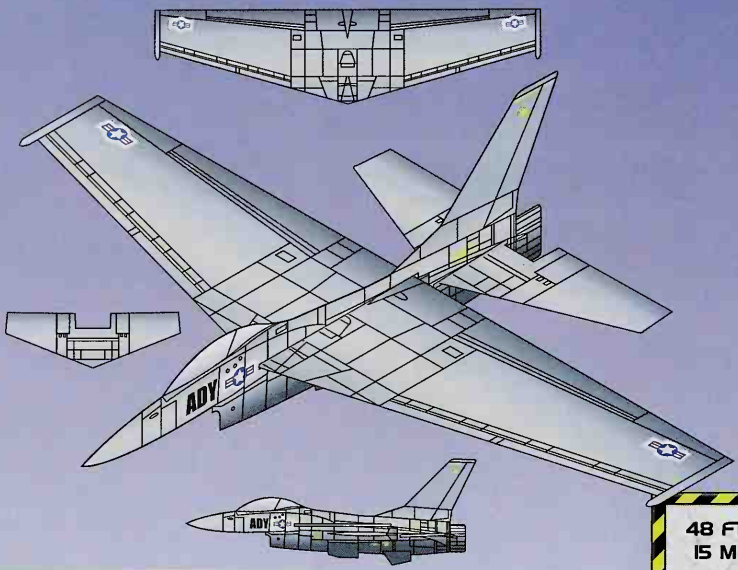


48 FT
15 M
Track Zone

Micro Flier Facts

- The Fokker Dr.I Triplane was the preferred fighter plane of the legendary German pilot, The Red Baron.
- With 80 confirmed victories, The Red Baron shot down more planes than any other pilot during World War I.
- The Red Baron was killed while flying a Fokker Dr.I Triplane.

F-16

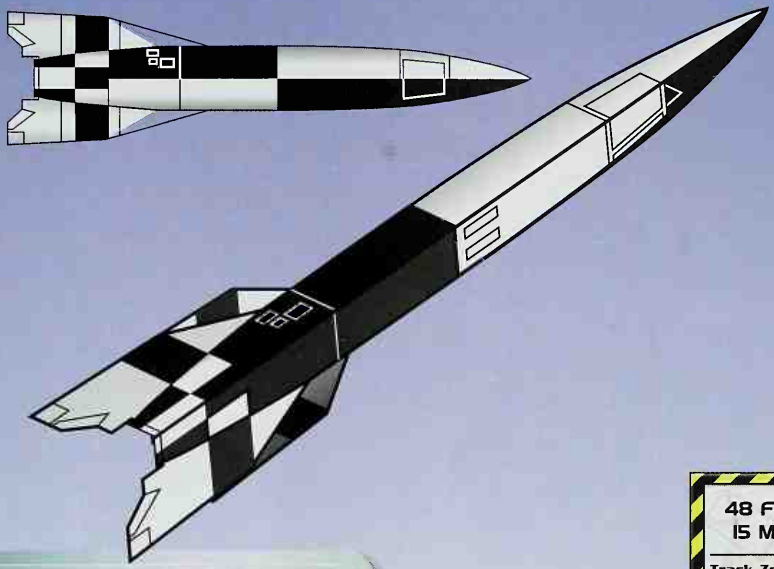


48 FT
15 M
Track Zone

Micro Flier Facts

- The F-16 'Fighting Falcon' was one of the most important airplanes on the Coalition side during the Gulf War.
- It has a top speed of 1,349 mph and can fly 49,987 feet above the ground.
- Due to its many successes, the F-16 will be in active military service for many years to come.

V2 rocket

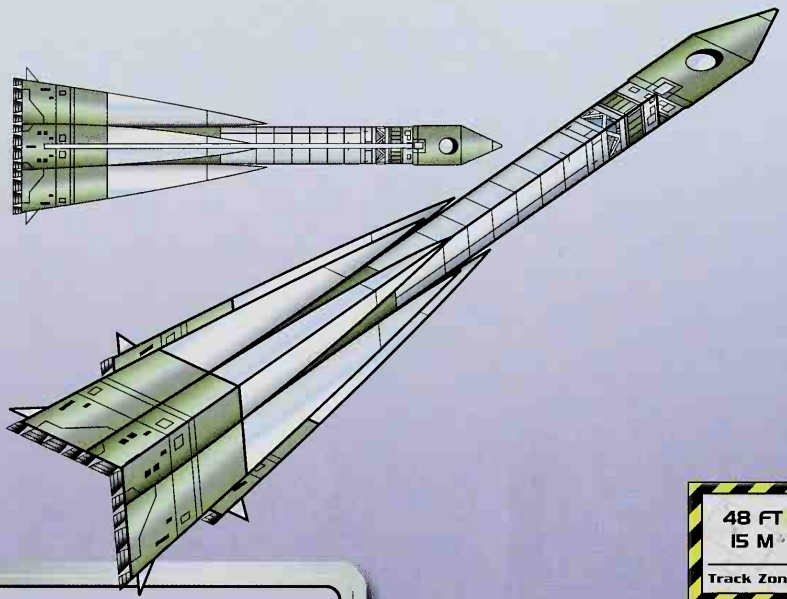


48 FT
15 M
Track Zone

Micro Flier Facts

- The V-2 rocket was built by a German research team led by a man called Werner von Braun in 1937.
- The V-2 rocket was the world's first long-range ballistic missile. It was one of the most devastating weapons used by the Germans at the end of World War II.
- In 1946 Werner von Braun surrendered his services to America to help develop the US space programme.

Vostok

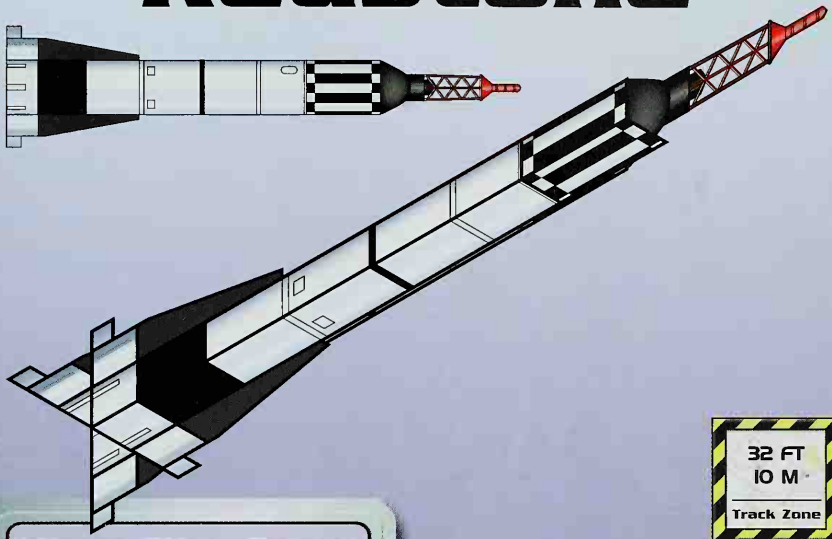


48 FT
15 M
Track Zone

Micro Flier Facts

- On April 12, 1961, the Russian Vostok A1 rocket carried the first human into space; his name was Yuri Gagarin. The mission lasted for 108 minutes.
- Later Vostok missions included the involvement of the world's first woman astronaut.
- A crater on the far side of the moon is named after Yuri Gagarin.

Mercury-Redstone

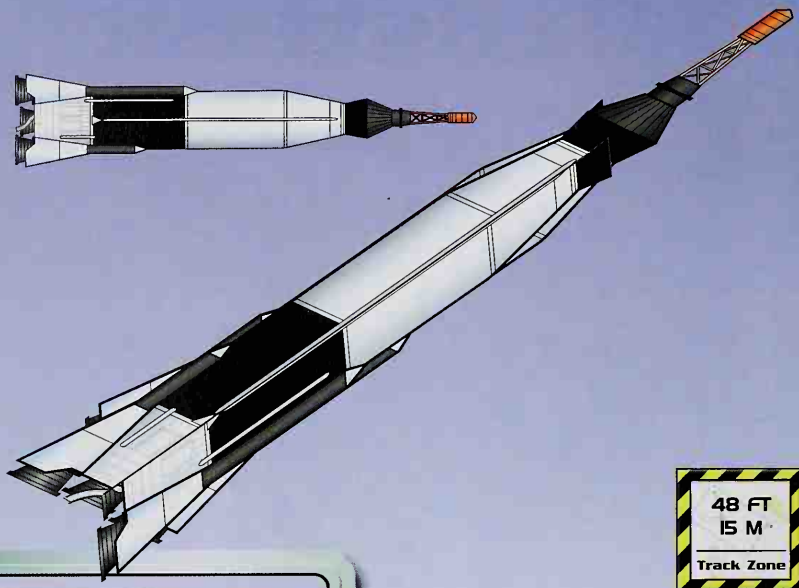


32 FT
10 M
Track Zone

Micro Flier Facts

- On May 5, 1961, the Mercury Redstone rocket was launched from the Cape Canaveral launch site.
- It powered the United States' first astronaut into space: his name was Alan Bartlett Shepard.
- The Mercury Redstone rocket is capable of 78,000 pounds of thrust at launch.

Mercury-Atlas

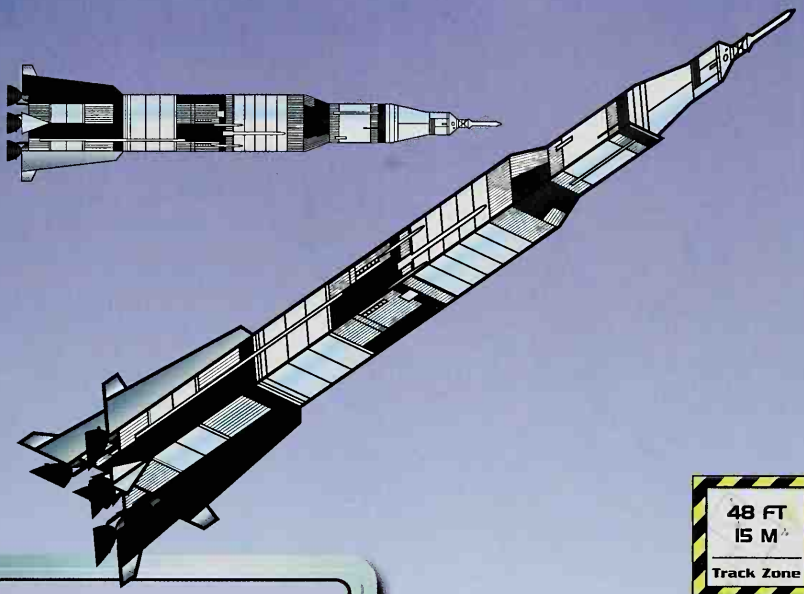


48 FT
15 M
Track Zone

Micro Flier Facts

- This Mercury Atlas rocket carried John Glenn's spacecraft into Earth's orbit, making him the first American to ever orbit the Earth.
- It was originally designed as an intercontinental ballistic missile (ICBM).
- Atlas has three engines and two boosters to help it reach orbital velocity.

Saturn V

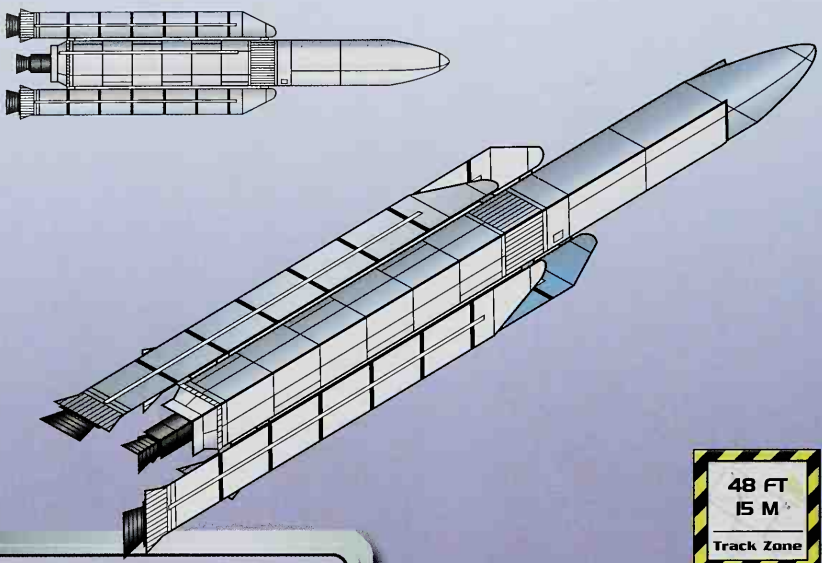


48 FT
15 M
Track Zone

Micro Flier Facts

- On July 16, 1969, a Saturn V rocket powered USA's Apollo 11 spacecraft to the moon. Four days later Neil Armstrong and Edwin Aldrin walked on the Moon.
- Saturn V rockets have been used for 13 space missions, including 10 manned missions.
- The Saturn V rocket is as tall as a 33 storey building.

Ariane 5

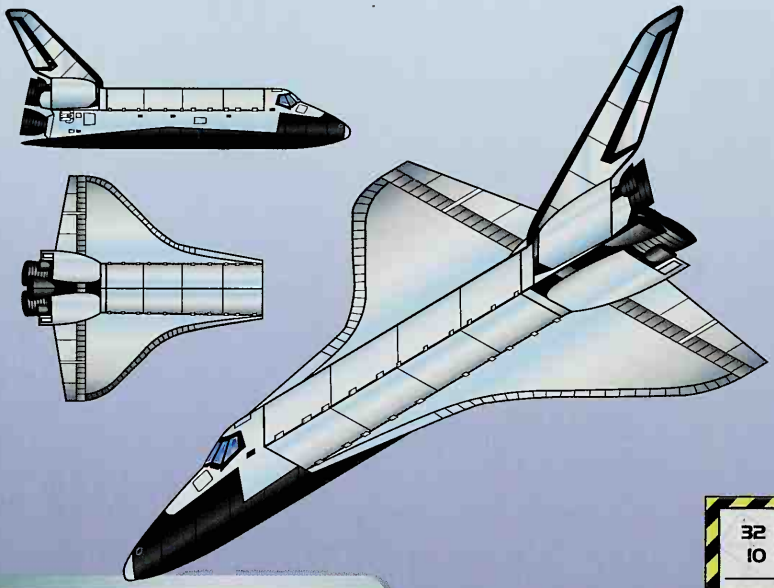


48 FT
15 M
Track Zone

Micro Flier Facts

- European Ariane rockets are commercial space carriers which can be hired by any country which wants to place a satellite in orbit above the Earth.
- There are six versions of the Ariane rocket, and all of them are completely computer controlled.
- The Ariane rockets are launched from a massive launch site in French Gayana, South America.

Columbia

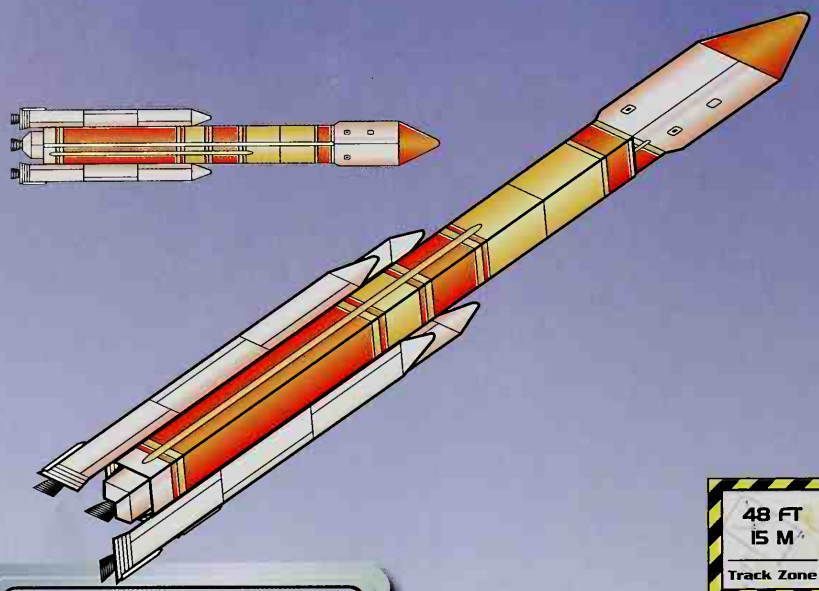


32 FT
10 M
Track Zone

Micro Flier Facts

- The first space shuttle, Columbia, was launched by the United States of America on April 12, 1981.
- Space shuttles can withstand temperatures of 2,500°F (1,350 °C)
- Shuttles are the only spacecraft that can be re-launched and sent on further missions.

H-11 Rocket



48 FT
15 M
Track Zone

Micro Flier Facts

- The Japanese National Space Development Agency hope to investigate the Sun, Moon and Mars using a variation of the H-II rocket.
- The Japanese space program is entirely peaceful and commercial. It is against the law to use space technology for military purposes.

Micro Flier Projects

Rocket Balloon

You will need

- Wooden pencil with an eraser on the end
- Pin
- Small round balloon
- Flexible drinking straw
- Tape

Newton's Third Law states that action and reaction are equal and opposite. Make a rocket from a balloon and a straw to see this law in action.

1 Slip the end of the balloon over the end of the straw which is farthest away from the bendable part.

2 Using a small piece of tape, attach the balloon to the straw. Make sure that you can still inflate the balloon through the straw.

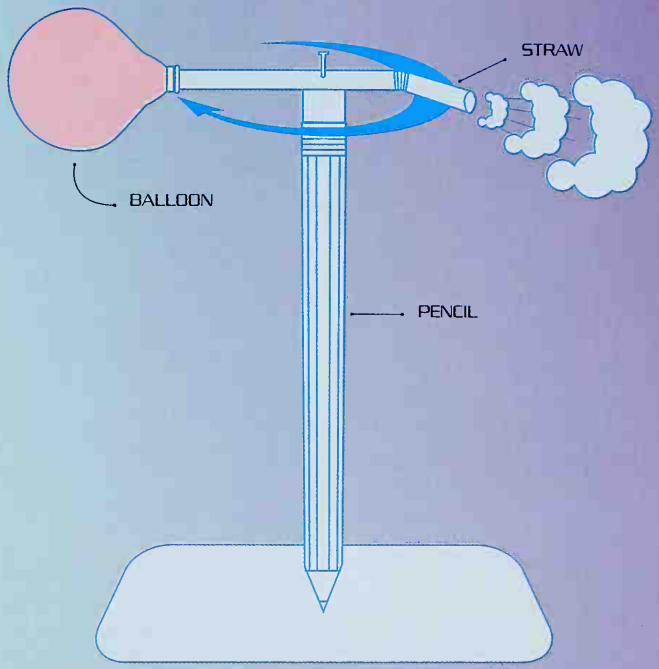
3 Bend the opposite end of the straw so that it forms an "L" shape.

4 Find the balanced point of the straw by resting it on your index finger. Make a mark on the straw at this point.

5 Push the pin through the straw at the place which you marked in step 4. Now push the pin into the eraser on the end of the pencil.

6 Inflate and then let go of the balloon, the straw will spin with a force exactly equal to the power created by inflating the balloon.

ROCKET BALLOON



Top Tip
Spin the straw a few times before you inflate the balloon as this will loosen up the hole and make movement easier.

Rocket Fuel Experiment

You will need

- Water
- Paper
- 2 sugar cubes
- Wooden spoon
- 2 glasses
- Stopwatch

Ever wondered how rockets get the power to escape from the Earth's gravity?

If the answer is 'yes', then read on.

1 Fill both glasses with 3½ fl oz (100 ml) of tap water.

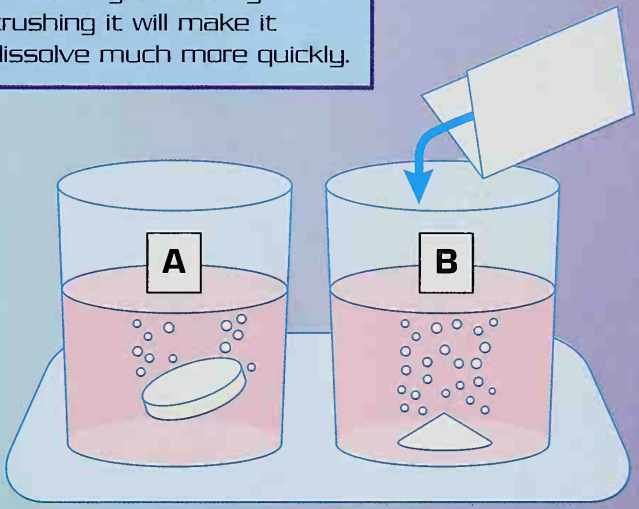
2 Drop one of the sugar cubes into beaker A and time how long it takes to dissolve.

3 Wrap a piece of paper around the remaining cube and crush it using the wooden spoon.

4 Pour the crushed cube into glass B and time how long it takes to dissolve completely.

FUEL EXPERIMENT

Rocket Science
Increasing the surface area of the sugar cube by crushing it will make it dissolve much more quickly.



Rocket Science
Rockets work on exactly the same principle, with a hollow core which extends the length of the area where the fuel is stored. The hollow core enables more fuel to be released and burnt giving the rocket the required power to escape the Earth's gravity.

Water Whoosher

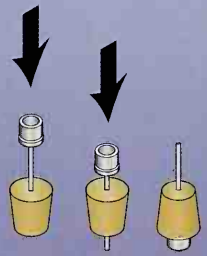
You will need

- Scissors
- Thick poster board
- Tape
- Sticky putty from kit
- Empty plastic bottle
- Bicycle pump & adaptor
- Needle valve from kit
- Cork from kit

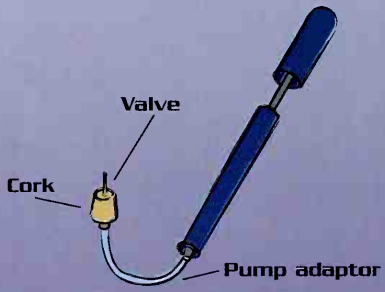
If you haven't seen a real space rocket take-off, then the Water Whoosher is the next best thing.

You will need adult help and a few items from around the house to complete this project.

1 Ask an adult to help you carefully push the needle valve all the way through the center of the cork.



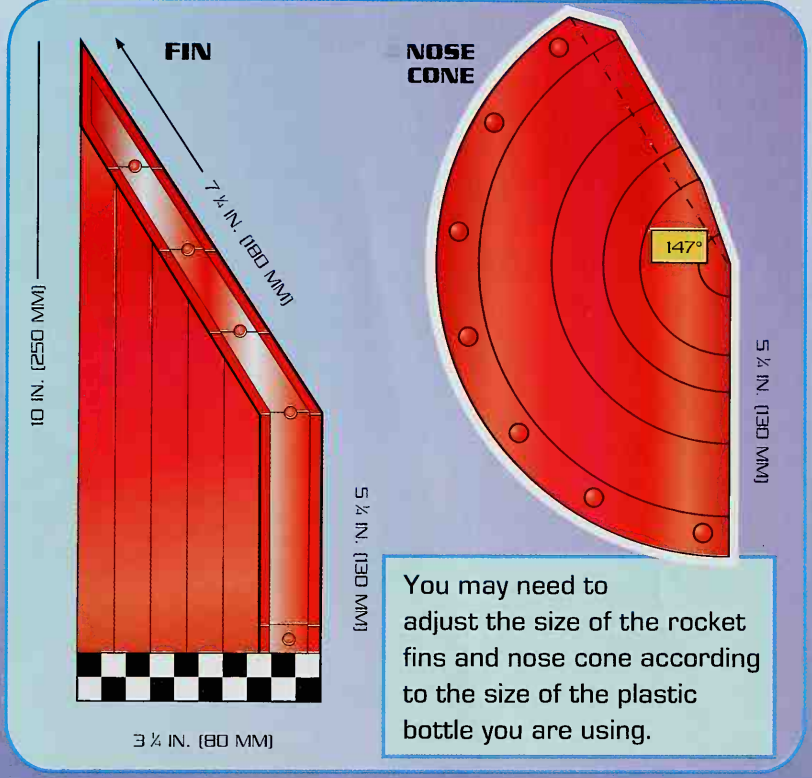
2 Now attach the bicycle pump adaptor onto the end of the valve.



ADULT SUPERVISION REQUIRED

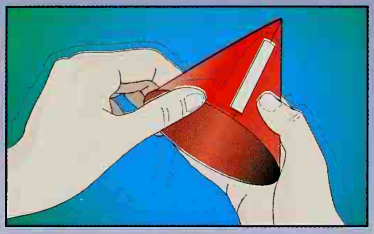
3 Using the template below, copy three rocket fins and one nose cone onto a piece of thick poster board. Cut out the shapes and decorate them like real rockets!

ROCKET TEMPLATE



You may need to adjust the size of the rocket fins and nose cone according to the size of the plastic bottle you are using.

4 To make the nose cone, take your template and close the two straight edges together, rolling the shape until the edges cross and a point is formed. Make sure the cone fits onto the top of your bottle, and then tape the straight edges together. Now tape the cone to the bottle.



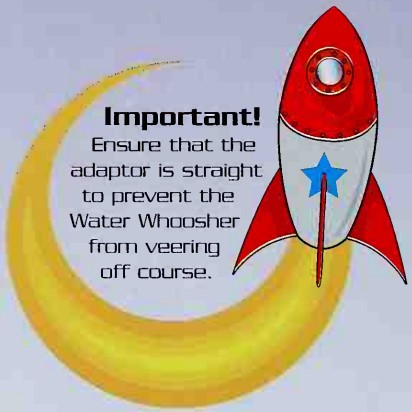
5 Arrange the three fins evenly around the base of the bottle. Attach each one to the bottle using tape on either side.

6 Fill the bottle a quarter of the way with water, then push the cork, valve and adaptor into the mouth of the bottle. Make a ring of sticky putty and mold it around the bottle top to form a seal.

7 Take the assembled rocket and bicycle pump to an open space, such as a park or yard.

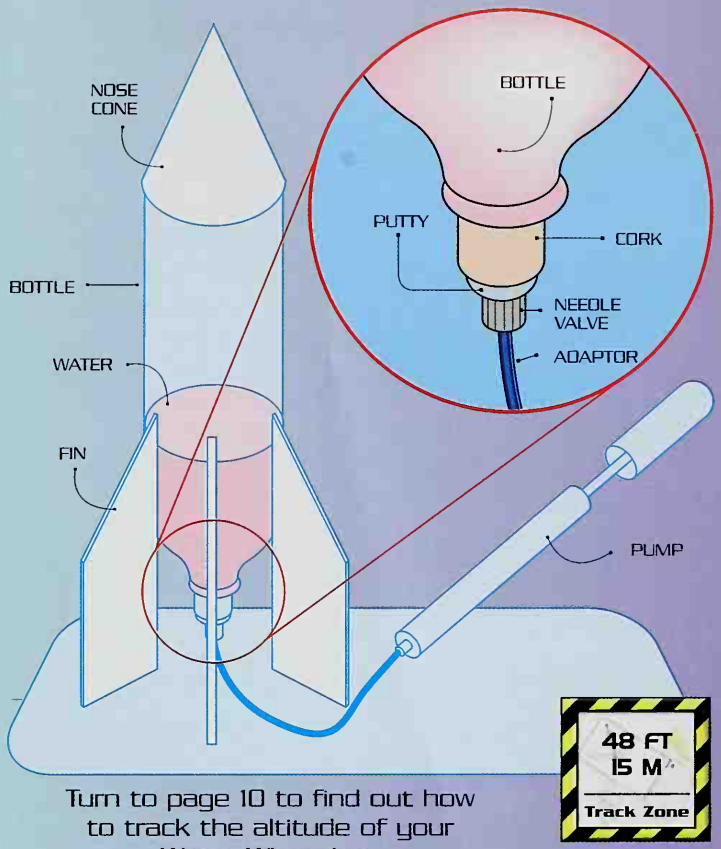
8 Attach the pump to the adaptor and balance the rocket on its fins. Start pumping!

9 As you pump, pressure will quickly build up inside the bottle. Suddenly, the cork will explode out of the bottom of the rocket and the Water Whoosher will shoot up into the air!



Important!
Ensure that the adaptor is straight to prevent the Water Whoosher from veering off course.

LAUNCH PROCEDURE



Turn to page 10 to find out how to track the altitude of your Water Whoosher.

Tricky Trajectories

You will need

- Bucket
- 3 small balls
- Playground with a merry-go-round

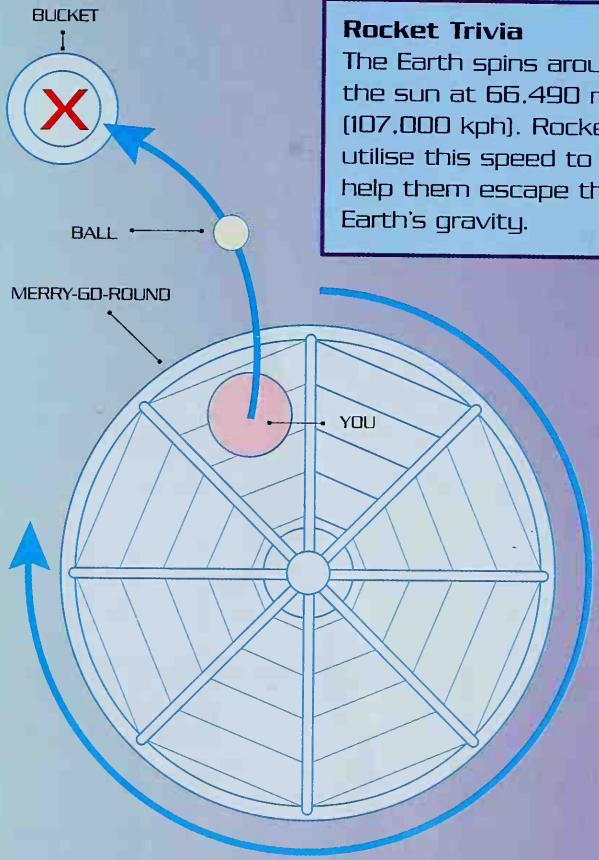
Have you ever tried to hit a target when you are moving?

Everything in space constantly moves around.

Try the following experiment to see how difficult it is for space engineers to plan a rocket voyage to other planets.

1. Find a playground which has a manually operated merry-go-round.
2. Place the bucket on the ground about 10 feet (3 metres) from the merry-go-round.
3. Take the balls onto the merry-go-round. Start it spinning.
4. Now, try to get the balls into the bucket by throwing them from your moving position.

Imagine how difficult it would be if the merry-go-round was spinning at over 62,100 mph! Space engineers have to do this for every single space mission, but they can't afford to miss the bucket.



Rocket Trivia
The Earth spins around the sun at 66,490 mph (107,000 kph). Rockets utilise this speed to help them escape the Earth's gravity.

Step Rocket

You will need

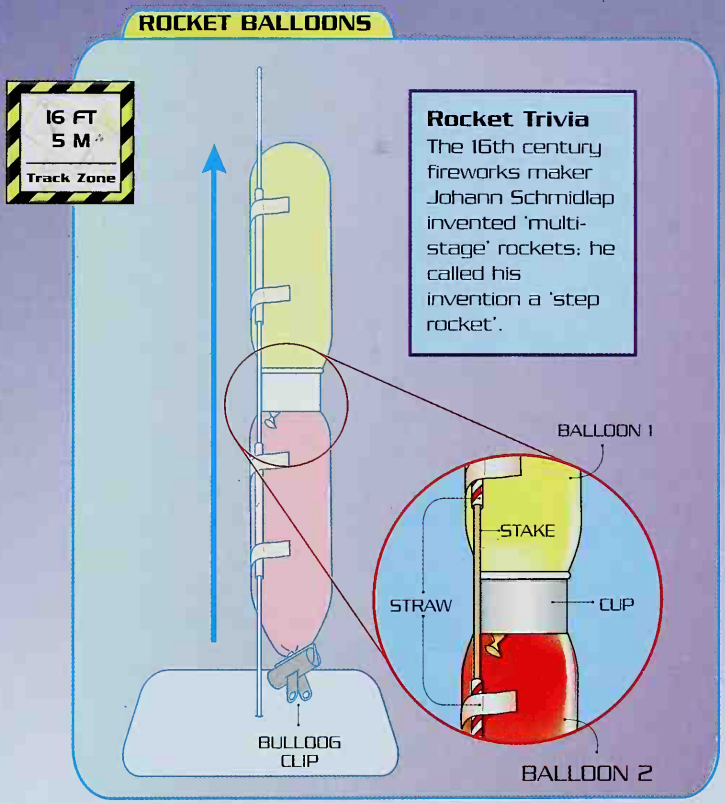
- 6½ ft (2 m) bamboo stake
- 2 plastic straws
- 2 balloons from kit
- Bulldog clip
- Styrofoam cup
- Masking tape
- Scissors

The Apollo 11 mission used three rockets at different stages of the voyage so that it could reach the Moon.

Recreate this mission by making a multi-stage rocket balloon.

1. Cut the styrofoam cup so that you have a ring.
2. Inflate the first balloon so it is ¾ full and hold the nozzle.
3. Partially inflate the second balloon, then slip the styrofoam cup over it (refer to the diagram on page 49 to help you).
4. Slip the nozzle from the first balloon through the cup which is on the second balloon.
5. Now fully inflate the second balloon. As it expands the cup should seal the nozzle of the first balloon.
6. Seal the nozzle of the second balloon with a bulldog clip.
7. Use tape to attach the straws to the two balloons – they must be in a straight line.
8. Thread the bamboo stake through the two plastic straws.

9 Push the stake into the ground in a yard or field, then release the bulldog clip for a great two-stage rocket flight.



Turn to page 10 to find out how to track the altitude of your Step Rocket.

DIY Rocketry

You will need

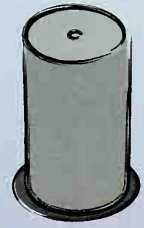
- Rocket canister (from the Kit)
- Rocket (from the Kit)
- Baking powder
- Vinegar

DIY rocketry is great fun if you follow the instructions carefully. If you achieve a flight of over 6ft (1.8 metres) you are an ace micro flier expert. How high can you make yours go?

WARNING

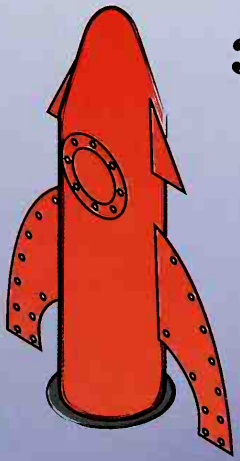
Rocket experiments can be dangerous!
Follow these simple safety rules to avoid accidents!

- Always launch your rocket in a wide, open space.
- Never point the rocket at anyone or anything.
- Do not lean over your rocket while you are trying to launch it.



1 Start by assembling the rocket. Take the lid off the canister from the kit.

2 Place a quarter of a teaspoon of baking powder into the container.



3 Add one teaspoon of vinegar – now you have to be really fast! Put the lid on the film canister, give it a little shake, then quickly slide the rocket over the top and place it on the ground.

4 The vinegar and baking soda will start to bubble and react, building up air pressure inside the canister until the rocket flies up into the air.

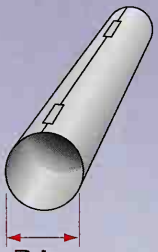
Space Shuttle

You will need

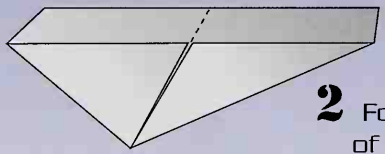
- 3 pieces of letter paper
- Felt-tip pens
- Scissors
- Tape

The first space shuttle, Columbia, was launched on 12 April 1981 by the USA.

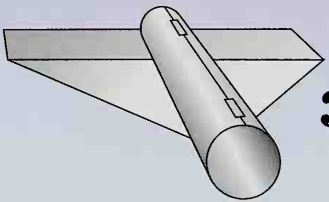
Follow the simple step-by-step instructions to make your own space shuttle.



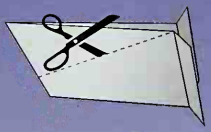
1 Roll a sheet of paper to make a cylinder with a diameter of 2 in.. Use tape to hold it together.



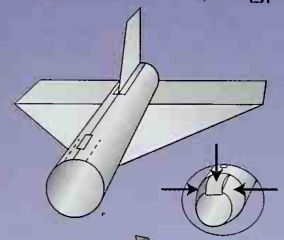
2 Fold the second sheet of paper in half. Then fold the corners into the center to form a point.



3 Tape the assembled cylinder onto the second sheet of paper to form the space shuttle body and wings.

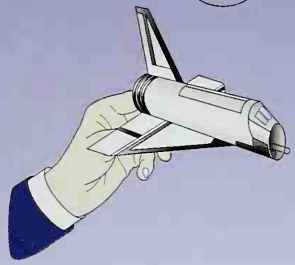


4 Cut a 7 1/4 in. x 3 1/4 in. paper rectangle. Fold it in half and fold 1/2 in. tabs at the end. Cut a fin shape and stick to the back of the cylinder.



5 Cut slots measuring 1 3/4 in. at the nose end of the cylinder. Fold down the resulting flap to form the cockpit.

6 Finally, attach two paperclips to the nose of the shuttle. Copy the completed space shuttle design on to your model or make up your own.



7 To launch your space shuttle, gently grip it at the back, hold it in front of your shoulder and throw forward with the front raised.

Micro Flier Facts

- To escape the Earth's gravity, a space shuttle must reach a speed of 24,840 mph. This requires massive booster rockets and a giant fuel tank.
- After completing a mission, space shuttles can be flown back to earth and used again in the future. The disposter boarded booster rockets can also be reused.
- The longest space shuttle flight lasted for 17 days, 15 hours, 53 minutes and 26 seconds.

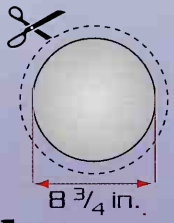
Parachutes

You will need

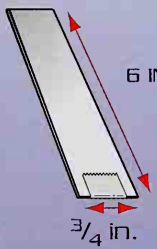
- 2 pieces of thread (each 24 in. long)
- Tape
- Paper
- Pencil
- Scissors
- Sticky putty
- Trash bag

As a rookie pilot, you may find the following Micro Flier very useful!

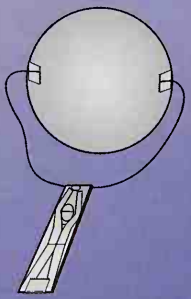
Challenge your friends to see who can make the slowest parachute descent!



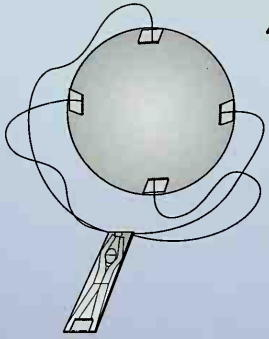
1 Cut out a circle measuring 8 3/4 in. in diameter from the trash bag.



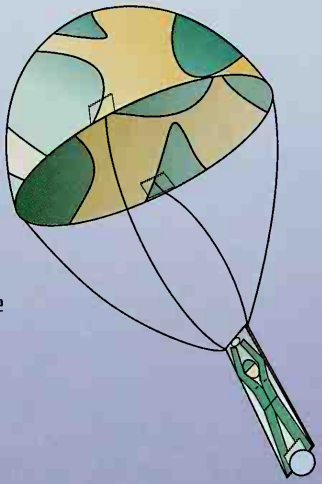
2 Cut out a piece of paper measuring 6 in. by 3/4 in.. Fold it in half and draw a parachutist on both sides. Wrap a piece of tape around the open end to form a loop.



3 Attach one end of thread to the edge of the circle using tape. Pass the loose end through the paper loop. Secure to the opposite side of the circle with tape.



4 Repeat this process so the parachutist is supported by both threads. The ends should be evenly spaced around the trash bag circle.



5 Finally, attach a small piece of sticky putty to the bottom of the parachutist.

Micro Flier Facts

- A parachute increases resistance by gathering air in its canopy. This slows down the descent so the parachutist lands safely.
- A French man called Andre – Jacques Garnerin made the world's first parachute jump on 22 October 1797. He made his descent from an air balloon over Paris.

Glider

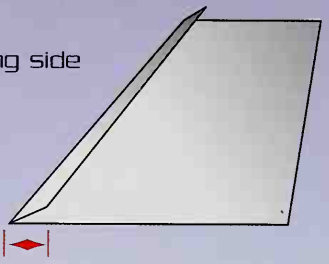
You will need

- A piece of letter paper
- Felt-tip pens

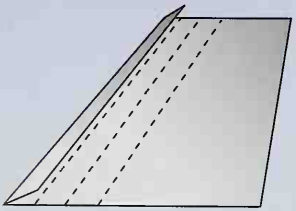
In the days before engine powered flight, we learnt a lot about flying from gliders.

Try flying your Glider in a heated school hall. Look to see if the warm air above the radiators gives your glider some much needed lift!

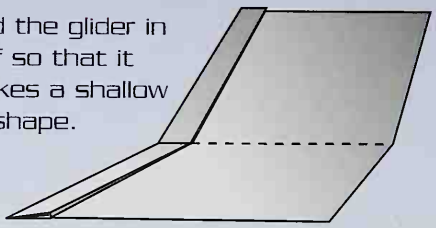
1 Make a $^{3}/_{4}$ in. fold along the long side of the paper.



2 In the same direction, make another four folds.



3 Fold the glider in half so that it makes a shallow 'V' shape.



MICRO FLIER RECORD

The world record for Paper Airplane Time Aloft (length of time your Micro Flier spends in the air) is 27.6 seconds.

4 Customise your completed glider with a groovy design.

5 Using your thumb and forefinger, gently grip the Groovy Glider at the back. Hold it in front of your shoulder and throw forward with the front lowered.

Micro Flier Facts

- When the sun heats the ground, the air above the ground is warmed and rises. Gliders use this warm air to gain height and remain in the air.
- Early inventors of gliding machines played an important role in the development of today's engine-powered flight.

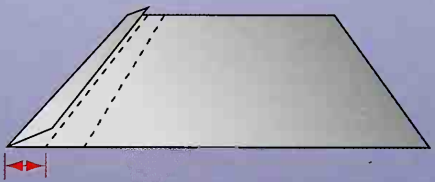
Stunt Bomber

You will need

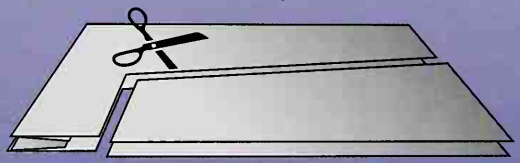
- A piece of letter paper
- Scissors
- Felt-tip pens
- Paperclip

Loop the loops and boomerang flight are plane sailing with this versatile Stunt Bomber!

1 Make three $^{3}/_{4}$ in. folds across the short side of your piece of paper.



$^{3}/_{4}$ in.

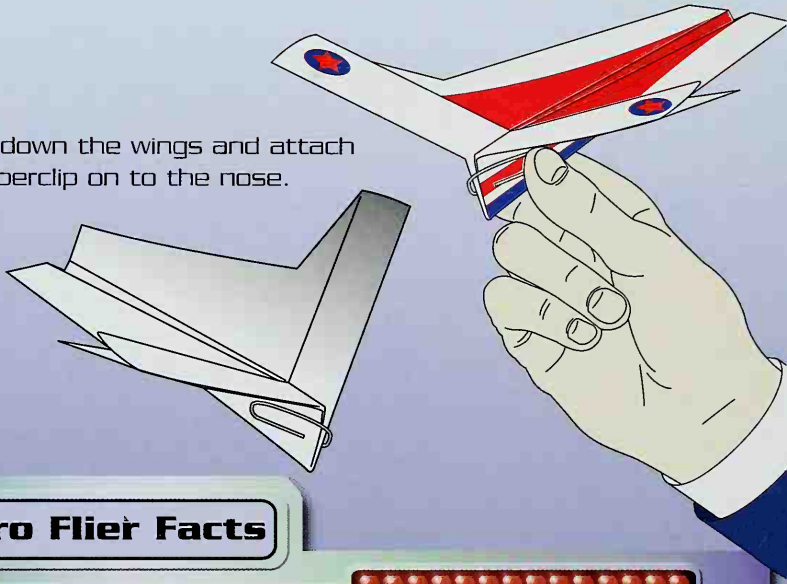


2 Fold the Micro Flier in half and cut away a section as shown.

MICRO FLIER RECORD

The longest recorded distance a paper Micro Flier has flown is about 193 feet!

3 Fold down the wings and attach a paperclip on to the nose.



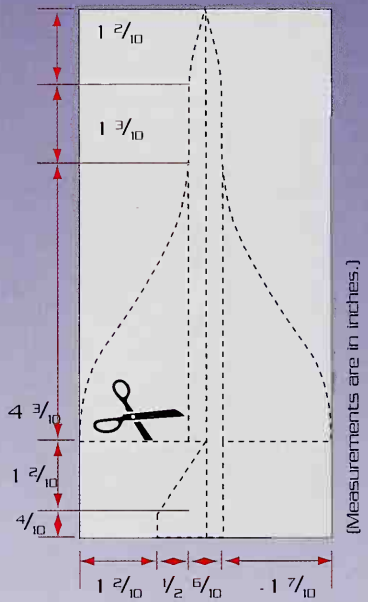
Micro Flier Facts

- This simple Micro Flier is capable of performing lots of gravity-defying stunts. Experiment with different throws to achieve a loop the loop or boomerang flight.
- Top tip: change the depth, angle and size of the cut in step 2 to increase the number of tricks your Stunt Bomber is able to perform.

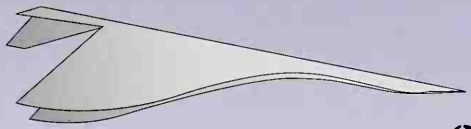
Concorde

You will need

- A piece of poster board (8 3/10 in. X 4 in.)
- Felt-tip pens (red and blue)
- Scissors

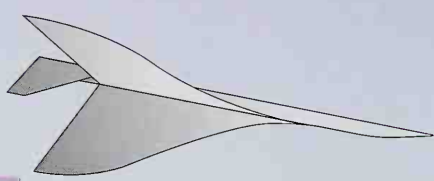


1 Copy the template onto poster board and cut it out carefully.



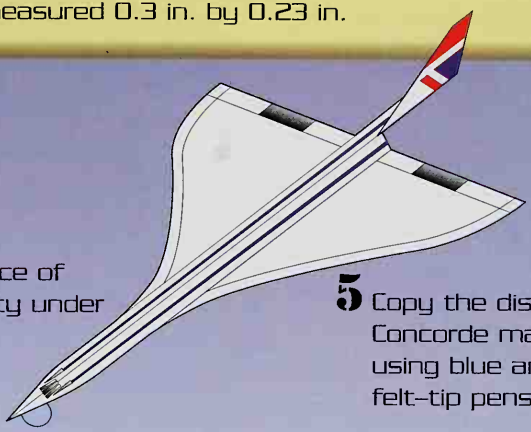
2 Fold the plane in half so that the wings point up. Make sure that the wings are the same size. Planes with uneven wings will not fly as well.

3 Fold each wing along the dotted line and bend them down so that they lie flat.



MICRO FLIER RECORD

The smallest Micro Flier on record was made from a piece of paper that measured 0.3 in. by 0.23 in.



4 Stick a piece of sticky putty under the nose.

5 Copy the distinctive Concorde markings using blue and red felt-tip pens.

6 Grip your Concorde Micro Flier between your thumb and forefinger in front of the wings. Hold it above your shoulder, throw hard, with the front slightly raised.

Micro Flier Facts

- Concorde is the fastest passenger plane in the world.
- It travels at 1,335 miles per hour, which makes it twice as fast as the speed of sound and means that it can cross the Atlantic in less than three hours!

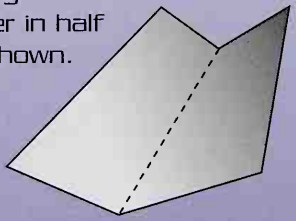
F15 Fighter

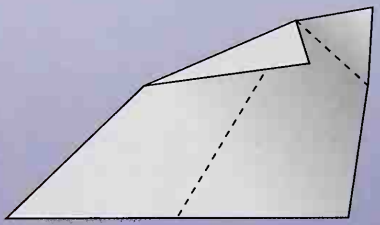
You will need

- A piece of letter paper
- Felt-tip pens
- Paperclip

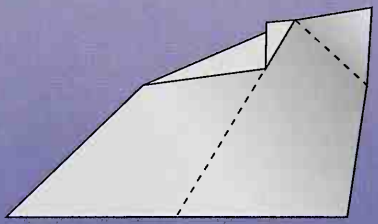
Designed for aerial dogfights, this marvellous micro flier loves to rock and roll!

1 Fold your paper in half as shown.

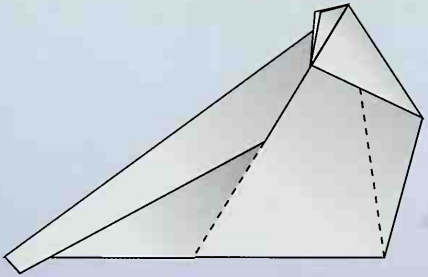




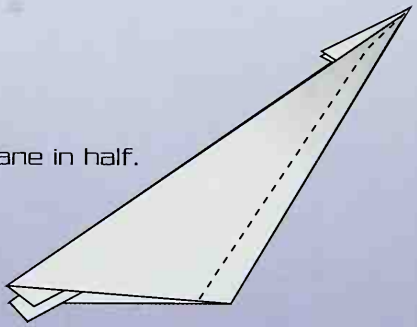
2 Fold the left corner individually so that it overlaps the center fold by $1\,{}^{3}/_{4}$ in.



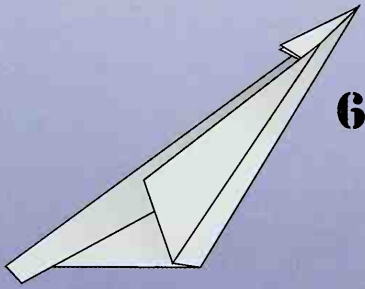
3 Using the center crease as a guide, fold the overlapping part from step 2 outwards. Repeat this process for the right corner.



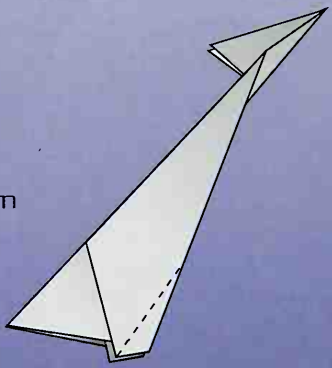
4 Fold the outer points into the center, leaving the middle flaps showing.



5 Fold the plane in half.

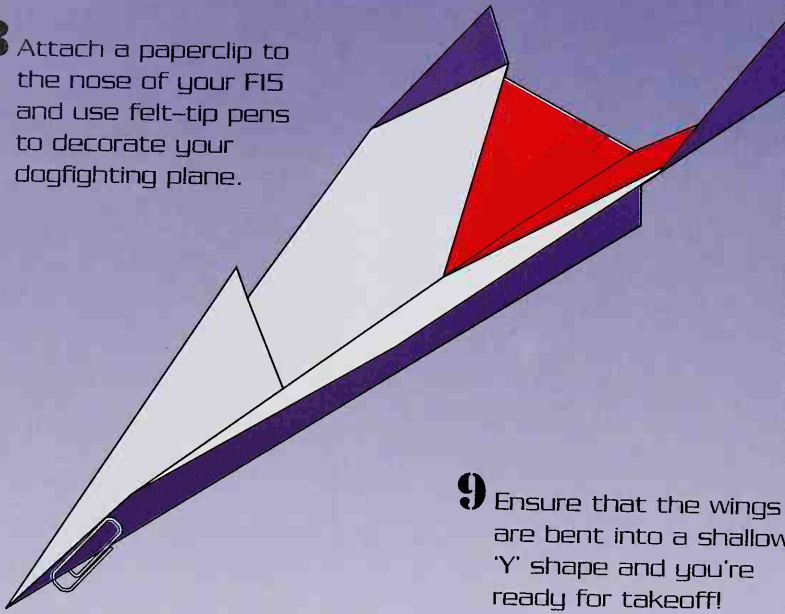


6 Fold down the wings. Be careful not to fold over the flaps which were created in step 3.



7 Open out the wings and make a small upward fold on each to form the F15's two tailplanes.

8 Attach a paperclip to the nose of your F15 and use felt-tip pens to decorate your dogfighting plane.



9 Ensure that the wings are bent into a shallow 'Y' shape and you're ready for takeoff!

Micro Flier Facts

- The F15 was designed by the Americans to counter the Russian MIG 25 Foxbat.
- The F15 can fly two and a half times faster than the speed of sound.
- With two tailplanes, the F15 is controllable even if its engines are damaged in a dogfight.

This book is sold as part of
Micro Fliers.
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